

Implications of social practice theory for the development of a numeracy programme for the Gusilay people group in Senegal

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Abstract

In this article, I present research on some traditional numeracy practices of the Gusilay people group in Senegal and make recommendations for developing a numeracy programme for women. Based on a strong foundation of traditional knowledge and practices, the programme will aim to meet felt needs of women who are faced with new numeracy related challenges due to changes in society. My research is placed in the framework of social practice theory, which emphasizes the fact that numeracy is not a set of skills that are learned and used in isolation, but rather practices that happen in context and vary with it. After a brief outline of social practice theory and the methodology I have chosen for my research, I analyze my findings from that perspective and suggest some practical implications for developing a numeracy programme for Gusilay women.

Key words: adult numeracy; social practice; ethnography; Africa

Introduction

In my work as coordinator for adult literacy programmes in several Senegalese languages I am often asked by literacy class participants why we do not offer a numeracy programme. Many learners, especially women, feel the need for acquiring more numeracy skills. For example, some women sell charcoal or cookies, but have no idea how to fix the selling price. Teaching numeracy to women within the context of a literacy programme will increase their understanding of basic mathematical concepts, strengthen their ability to mathematize and give them skills and confidence to better face numeracy related challenges. I decided to review relevant literature and to research traditional numeracy practices of one people group, the Gusilay, in order to be better equipped to help meet these felt needs. I set out to investigate the following questions: What are the felt needs of Gusilay women in the area of numeracy? What are some of their traditional numeracy practices?

Literature tells me that each society develops mathematical ideas in a different way due to various factors, based on the needs of the group (Zaslavsky, 1999). In order to build a curriculum for a numeracy programme that is designed specifically for the target group, relating to their cultural values, practices and needs, a thorough analysis of the situation, including linguistic and social research into existing numeracy practices and felt needs is required (Dalbéra, 1990). Moreover, basing the curriculum on traditional practices and beginning with what adults already know should build motivation, help learners overcome their fears of not being able to learn numeracy and enable them “to develop their ability to cope with their problems themselves” (p. 11).

This article begins with a brief summary of social practice theory and the methodology I have chosen, followed by some background information on the Gusilay people group in Senegal, their number system and a description of my participant observations of three numeracy “events” (Heath, 1983) from harvesting rice to cooking, and selling vegetables. A discussion of the implications of my findings, from a social practice theory point of view, leads to various suggestions for the development of a numeracy programme for Gusilay women. This time could be seen as a critical moment in adult mathematics for the Gusilay people group, when important questions are raised that will influence the development of a relevant numeracy programme.

Social practice theory

Developed in the context of literacy (Barton & Hamilton 1998; Gee, 1990; Street, 1984;), social practice theory emphasizes the fact that literacy practices are embedded in broader social and cultural practices and are influenced by the context in which they happen. Moreover, the purposes and meanings a reader brings to the text vary. Literacy is therefore not just a set of mechanical skills that, once acquired, can be used in other situations. Street criticized what he termed the “autonomous” view of literacy, which “works from the assumption that literacy in itself – autonomously – will have effects on other social and cognitive practices”, and suggests that “in practice literacy varies from one context to another and from one culture to another and so, therefore, do the effects of the different literacies in different conditions.” (2003, p. 77).

Even more so than literacy, mathematics had for a long time been viewed as decontextualised and value-free, an abstract code with unlimited power of transfer. This idea was challenged through research in the 1980s (Carraher, Carraher & Schliemann, 1985; Lave, 1988; Saxe 1991), which led Lave and Wenger (1991) to propose the concept of “situated learning”, viewing learning as a social process that happens in a specific context and involves relationships, motivation and values.

The implications of social practice theory for numeracy have been researched and discussed (Baker, 2009; Baker, Street & Tomlin, 2008; Evans, Wedege & Yasukawa, 2013; Tett, Hamilton & Hillier, 2006;). Baker (2009) adapted social practice theory to numeracy, emphasizing the fact that “numeracies”, like “literacies” vary with the social context and have different associated uses and meanings. According to him, mathematics as social practice implies “being aware that mathematics takes place in contexts with values, beliefs and social relations” (p. 6) and using a constructivist approach that “takes a broad vision of learners’ funds of knowledge for mathematics”, including not only skills, but also “processes of engaging with mathematics” and relationships etc. (p. 7).

Tett, Hamilton & Hillier (2006) point out various implications for practice regarding the curriculum, learning, teaching as facilitating and supporting rather than transmitting information, the roles of curriculum managers and other key programme personnel. They appreciate the fact that a social practice view provides a framework that even allows a numeracy programme itself to be analysed and understood as a set of numeracy practices. According to the authors, a social practice perspective on numeracy “is not just meant to be descriptive but engaged – it changes the situation it analyses by articulating new understandings and learners and teachers to actively ‘take hold’ of adult literacy, numeracy and language and shape it for their own purposes” (p. 13).

Evans, Wedege & Yasukawa, with regards to social justice issues, point out the fact that adult mathematics education that starts with learners’ numeracy practices and therefore with different social situations, means that there is a tension between affirming learners’ roots and “the generalizing views of mathematics that smooth out these differences” (2013, p. 225). In the context of a numeracy programme for Gusilay women, this could mean that even though the numeracy programme helps

women to be more efficient in their traditional activities as market vendors, it enables them at the same time to run a shop or eventually become a financial consultant, which are male dominated domains.

Methodology

There are several reasons for my choosing social practice theory as the framework for my research. My review of literature on social practice theory (Papen, 2005; Street, Baker & Tomlin, 2008) and on numeracy practices in non-Western countries and ethnomathematics (D'Ambrosio, 2001; Gebre et al. 2009; Nabi, Maddox, 2001; Rogers & Street, 2009) have made me aware of the importance of context. Moreover, in my opinion, social practice theory matches the holistic worldview that is characteristic of Senegalese society, one of many cultures that "value contextual understanding rather than decontextualization and objectivity" (Ascher, 1991, p. 6). Another rationale for taking into account the insights of social practice theory is provided by adult education theory, emphasizing the wealth of knowledge and experience adults bring to the classroom and the importance of relevance to daily life (Knowles, Holton III & Swanson, 1998).

An ethnographic approach, commonly used in anthropological research, seemed by far the most suitable method for studying numeracy as social practice, observing and describing numeracy practices in the context in which they occur. During a total of four weeks of research in the town of Thionck-Essyl, between October 2011 and January 2012, I participated in various numeracy events. The research tools I used were participant observation, unstructured discussions and visual methods, especially photographs and where possible artefacts. I made an effort to choose people without school experience, but found that some of them had formal schooling.

Numeracy practices of the Gusilay ethnic group in Senegal

Background information

The Gusilay live in Thionck-Essyl, a town with a population of about 15,000 inhabitants, situated in the Casamance region in the south of Senegal. Traditionally, they have been agriculturalists, mainly growing rice but also millet and peanuts. Preparing the rice fields, before and at the beginning of the rainy season, is men's work. Sowing, transplanting and harvesting traditionally is women's work, with women often working together. Each married woman automatically joins an age group when she gets married. Women of the same age group, who got married during the same period in the same part of town, often do activities together. Moreover, women frequently organise themselves by forming associations, often with the goal of earning money, e.g. by harvesting other people's rice fields as a group. Most women work hard every day, with highlights in the hardships of life being celebrations that include singing and dancing. Relationships are characterized by solidarity and much teasing and laughter.

Overall, less than 40% of Senegalese women over the age of 15 are estimated to be literate (UNESCO, 2012). Many younger Gusilay women have gone to school for a few years. The language of instruction there is French, a language not understood by most children when they enter school, and repetition and drop-out rates in Senegal are high. The Gusilay are motivated to learn to read and write in their language and especially to become more proficient in the area of numeracy since life has changed drastically in recent decades. There are many new numeracy related challenges women have to face nowadays. Whilst growing rice is still the occupation of many inhabitants of Thionck-Essyl, an increasing number of women run small businesses to meet the needs of growing family expenses. Money is used in more domains, as can be seen with payment for school equipment and electricity bills, since the town recently got electrified.

Banks attract a growing number of clients. New technologies like cell phones, scales, calculators or computers are introduced. With these changes comes a need for acquiring more and different skills and knowledge. In conversations with members of our partner organisations and also through questioning women in the literacy classes I coordinate, I found that women's main goal in wanting to learn numeracy is improving the financial situation of their families. Areas of special interest that were mentioned were learning to count and calculate better, dealing with money and calculate profit, understanding written documents (e.g. bank statements or children's health records), keeping track of family expenses and knowing how to weigh in order to sell in bigger quantities or in income generating projects like soap making.

The Gusilay number system

Whilst an in-depth discussion of the number system is beyond the scope of this article, I will mention some basic facts that I consider most relevant for the development of a numeracy programme. Here is an excerpt of Yashina's (2011) list of the main cardinal numbers in Gusilay.

1	yanur	10	guñen (lit. 'hands')
2	síruba	15	guñen gaat (lit. 'hands foot')
3	sífaajir	20	gafaakan (lit. 'the end of a person')
4	sibaagir	30	gafaakan n'guñen
5	futok	40	gafan gúruba ⁵⁵
6	futok n'yanur	60	gafan gúfaajir
7	futok n'síruba	80	gafan gubaagir
8	futok n'sífaajir	100	eceme
9	futok n'sibaagir	1,000	éwuli

There are distinct number words for the numbers 1 to 5, 10, 15, 20, 100 and 1000. All other numbers are mathematical calculations. Number words get long as numbers get higher⁵⁶. 100 and 1000 are loanwords from a dominant language in the area. There are two traditional bases, 5 and 20, and a more recent one, 10 (Kané, 1987). Vocabulary for new concepts like 'plus', 'minus', 'tens', 'hundreds' or 'book-keeping' would need to be developed, ideally based on traditional concepts. For example, there is the expression 'gassañar' that might be used to explain the concept of units and tens: Traditionally, the fruit of a certain palm tree is cut, one or two bunches per tree, and put into piles of ten on the ground. For example, you will say that you have five 'gassañar', five piles of ten.

There is a difference between numbers in general and numbers in the context of money. Calculating with money in Gusilay is based on the 'ékori', with 1 'ékori' equalling 5 F CFA⁵⁷. Therefore when numbers are used in the context of money, the value is actually five times as much as the word itself (e.g., 25 F CFA is called 'futok' [five, understood 5 'ékori'], even though the print on the coin says 25). There are various proverbs that contain numbers and riddles, for example: "I have two children and two adults. They have gone fishing and caught three fish. Each of them has got one fish." (Solution: Son, father and grandfather).

⁵⁵ 'Gafan' is a contraction of 'gafaakan'. 'Síruba' becomes 'gúruba', since it adapts to the noun 'gafan', Gusilay being a noun class language where attributes, including numerals, change according to the noun they define.

⁵⁶ 773 is 'siceme futok siruba guñen gafak bugan gúfaajir guñen sífaajir'.

⁵⁷ Franc de la communauté africaine.

Participant observation of various numeracy practices

Working in the rice field

Since it was harvest time, I spent a day doing participant observation on harvesting rice. Here is an account of my observations. I join seven women, who belong to the same age group, to harvest a 'ñikin' (rice field) that belongs to one of them. We walk on small paths for about an hour, the women carrying baskets with water, knives, some food and rolled-up strips of leaf from a certain tree that are used for binding the sheaves. After a quick breakfast of rice and curdled milk we start cutting the rice. The women work in rows, each one cutting the rice at the bottom of the stem with a knife.

The woman beside me shows me how to hold the rice I have cut, with the stems in the palm of my hand and the leaf outside my thumb. From time to time I tear off the leaves. The women talk whilst working, mainly about their work for the next few weeks. Each stem is cut by hand with a knife, the length being assessed by visual judgment, maybe 20-30 cm according to my guesses. When a 'galiten' (handful) of rice is cut, it is laid on the ground on top of a row. The 'galiten' do not seem to be of a definite size.

One woman tells me: "You lay it down so that your hand does not get tired because the rice is too heavy". One of the women binds the 'galiten' together into an 'ekok' (sheaf). She wraps a strip around the first 'galiten', then adds the next one, pushing down hard and wrapping the strip tightly. When asked how many 'galiten' make up the 'ekok' she is binding, the woman does not know the answer. My colleague has counted: There are ten 'galiten'. She wonders whether it is the length of the strip that decides the size of the 'ekok'. One of my informants tells me later that in the past sheaves used to be much smaller. We finish the 'ñikin' in about two hours, having harvested eight sheaves of rice.

Each woman brings her own rice for lunch, whilst the owner of the rice field has to contribute the fish. She also pays 1,000 CFA and gives two sheaves of rice to the association they all belong to. The women tell me that women's associations can be hired to work on anybody's field, but then the price is higher. Reflecting on my participant observation, I realized that the main strategy used in working in the rice field is estimation and approximation by visual judgment. The length of the rice stems, the measure of 'handfuls' of rice as well as the size of a sheaf are all determined by visual judgment based on experience. I am told that visual judgment is also used in sowing and transplanting, e.g. for determining the distance between individual seeds and between the seedlings when transplanted to the rice field into three lines on each row. Estimation seems to be a much more useful skill in this society than measuring with exactness.

The women I observed are of the same age group and at the same time organised in an association, together with other women. There are clear regulations as to the contributions of each person involved. As a newcomer, I joined in the activity, learned by doing and was shown how to do it correctly by one of the women.

Cooking the daily rice dish

I spend a day with Khady, my host. We cook a dish called 'etoj ekaama', rice with a sauce of ground peanuts and manioc leaves. Khady is 35 years old and is pregnant with her eighth child. She lives in the same house with her husband, a second wife and their children. The kitchen is a square house made out of dried earth, with a roof and several small rooms. We sit in the little square porch area on little stools while cooking. When I ask Khady at what time she starts cooking, she says, "It does not matter when exactly". The children come home from school between 1 and 1.30pm, and the food

should be ready shortly after. Khady tells me that she has a cell phone that she could consult to check the time. Around 10 am - I check my watch - Khady sends a boy to the market with money and instructions as to what he should buy. I see him come back with six packets of peanuts, a hot pepper, a piece of dried fish, four green bitter tomatoes, four stock cubes, a piece of dried sea snail and a packet of small beans. Khady must have calculated the amount of money she needed to give him in advance. She has been to school and speaks some French.

We pick a bucket full of manioc leaves in a nearby garden. Another boy is sent with 200 CFA to have them shredded at a mill. We could have pounded them ourselves, but I am told that this would take too long. These days Khady buys three sacks of rice per month, all at once, since her own rice is already finished and the harvest on her rice fields has not yet started. She tells me that she uses three nescafé tins of rice per meal. I know from another informant that in the past, woven baskets were used in the kitchen, 'gáfankum' for storing rice and 'funip' for storing peanuts or salt, but nowadays empty nescafé tins have replaced the baskets for measuring rice.

Having crushed the peanuts in a small mortar, several handfuls at a time, we sieve them through a strainer with fairly big holes and afterwards one with a finer mesh. The rice is first steamed, on a strainer on top of a pot of boiling water, with a cloth ribbon wrapped around the gap between the pot and the lid to seal it. Khady takes a handful of salt from a big mustard jar and puts it on top of the rice. Then she dumps the rice into the boiling water. She says she just knows how much water to put into the pot and how long she needs to let the rice steam and then boil. Then she puts the cooked rice aside, adds more charcoal to the fire and puts on a new pot, about 1/3 full with water, for the 'etoj' sauce. She washes the green tomatoes in a bucket of water, takes the stems off and puts them into the boiling water. Two of Khady's smaller children sit with us, and the baby is on her back. A chicken runs on top of the roof beams from time to time, and dirt falls on me. We chase it away several times.

The boy comes back with the ground manioc leaves; they now cover only maybe 5 cm of the bucket. Khady puts them into the boiling water. She washes the dried fish and the piece of snail and adds it. Then she puts the peanut powder into the now green water. From time to time she stirs the sauce with a big metal spoon. I notice that she lets it simmer for at least two hours. Finally Khady adds the hot pepper, the stock cubes and two spoonfuls of shrimp powder, which she takes from a big mustard jar. Her daughter Awa, who has just come back from school, is putting the rice onto two platters, when Khady suddenly realises that she has forgotten to add the beans. Awa crushes them, using pestle and mortar, and Khady puts them into the sauce and lets it boil for another 30 minutes or so according to my reckoning.

Reflecting on my observations, it struck me that my way of categorising is different from the traditional Gusilay way. 'Time', for example, is numerical information for me, whilst for a Gusilay, it might be in the category of 'the way relationships are used' or 'duration of an activity'. Traditionally, numbers have not played a big role in many mathematical concepts in Africa (Zaslavsky, 1999).

Moreover, I realised that women all over the world cook using estimation and approximation, techniques honed through experience. And certainly women all over the world, and specifically in Senegal, are not aware of how much mathematical knowledge is applied when cooking. The amounts of water or salt are assessed by estimation and approximation, as is the time needed for cooking. Strategic planning is involved in deciding what ingredients to buy for the daily meal or how many bags of rice to purchase per month. Many of these strategies are applied largely unconsciously due to daily routine and experience.

Measuring capacity is based on the body, e.g. a handful, or on varying containers, e.g. spoonful, bucketful and various pots. Khady knows from experience what size cooking pots and platters to use. There is no interrelated system for measuring capacity. Some of the strategies include the use of

number. Mental calculation skills were put into practice as Khady decided how much money to give to the boy to buy ingredients at the market. Khady knows money, and she knew how much money to give to the boy to go shopping, so she must have some mental calculation skills. I did not ask her where she learned those. Her assessing the value of time versus money when sending the boy to the mill is an example of numeracy being linked to values. It might be interesting to find out whether her appreciating time over money was influenced by my presence.

Selling condiments at the market

The market place of Thionck-Essyl is a big square of roughly 40 x 40 m, bordered by mango trees. About 20-25 women vendors sit on small wooden stools or plastic buckets under the trees, some with wooden tables on which their goods are displayed, some with plastic mats on the ground. I join them for several days to observe them and learn from them.

The president of the market, an elderly lady named Mariama Sambou, sits on a bucket behind her goods, which are laid out on a big plastic sheet on the ground. She tells me that she has never gone to school and has traded for 30 years. This reminds me of Bhola's emphasizing the fact that "oral numeracy" (1994, p. 89) is a cognitive process unrelated to the learning of reading and writing. Mariama tells me that she has never taken a pen to calculate, but does it all mentally. She tells me that she prefers to not make errors, because it is she herself who has a problem if she does, and that she makes fewer mistakes than others who write.

Mariama sells slices of cabbage, carrots cut in halves, manioc, dried fish, fresh hot peppers, onions, hot dried pepper, tomato paste in little plastic bags, stock cubes and other ingredients that women need for their daily cooking. Women buy these each day in small quantities, which is why the market vendors can make a profit by selling their goods in small quantities. The market women chat with each other and their clients. A young woman with a baby on her back buys a pile of onions and hands Mariama a coin. Mariama asks her neighbour to exchange the coin into smaller ones; having small coins is a challenge in Senegal.

Mariama sells three kinds of dried fish: 'con', 'bërr' and 'dëggërbopp'. She tells me that she bought 1 kg of 'con' for 600 CFA; 1 kg equals six fish. She cuts each fish into three pieces and sells the piece for 50 CFA. This is how her mental calculation works: She takes two fish, which makes six pieces in total. Again two, that makes 12 pieces; again two, that makes 18 pieces. She sells 12 pieces at 50 CFA each, which makes 600 CFA, then the six that are left: 300 CFA, so she sold for a total of 900 CFA. I reflect on the fact that multiple additions seem much slower and more complicated than multiplications. She takes off the 600 CFA and sees that she has a profit of "only 300 CFA", as she says. For the 'bërr', she paid 1,500 CFA for 1 kg. She sells a piece for 100 CFA. There are 18 pieces in 1 kg. She sells for a total of 1,800 CFA and knows that she again has a profit of 300 CFA.

She bought 1 kg 'dëggërbopp' for 800 CFA. 15 fish weigh 1 kg. First she sorts the fish. She sells the big ones for 100 CFA, the middle ones for 75 CFA and the small ones for 50 CFA. She gives me an example:

She sells five fish at 100 CFA, which makes 500 CFA. She has ten fish left. Then she sells four fish at 75 CFA. For this she calculates in her head "75 times 2 makes 150, and again 75 times 2 makes 150, so the total is 300 CFA". She has six small ones left, which she will sell for 50 CFA. She calculates with five. If she sells five, she gets 250 CFA. The last one makes

50 CFA, so the total is 300 CFA. Five for 500 CFA and four for 300 CFA makes 800 CFA. She knows that that is the price she bought them for. "So I know that my profit is identical with the six little fish, that is 300 CFA", she says. It strikes me that she does not add up all the income and then

deduct her cost, but states that her profit is identical with the fish that are left, a concrete object rather than an abstract number.

Mariama also explains how she calculates the profit she makes from selling onions. She buys a 25 kg bag of onions for 7,500 CFA in the nearby town of Bignona. She pays 200 CFA for the transport of the bag and 900 CFA for herself. She calculates only one way transport expenses into the cost of the onions, and the return trip she will calculate with the other goods she bought. When she gets home, she first weighs the sack with the scales she owns. Sometimes there are 26 or 27 kg in a bag. She weighs per kg and then counts how many onions there are in 1 kg. She gives me an example: There are eight onions per kg. She wants to sell the kg at 500 CFA. If they are all the same size, she sells one for 75 CFA. She puts the onions in groups of four, which makes 300 CFA per group. She knows that she can sell the kg for 600 CFA if she sells the onions one by one or per group. If she sells them by kg, she will have 500 CFA only for the kg. She earns 100 CFA more per kg if she sells one by one. Afterwards she thinks some more about the bag. She takes 20 kg. Each kg she will sell for 500 CFA, so 500×20 makes 10,000 CFA for 20 kg. The rest is $5 \text{ kg} \times 500 = 2,500$ CFA. The total is 12,500 CFA. She takes off the 7,500 CFA that she spent on buying the bag. Then she takes off the transport cost of 1,100 CFA, which leaves her with a profit of 3,900 CFA. If she sells each onion separately, she has more profit, between 5,000 CFA and 6,000 CFA total.

Mariama puts the money she earns in her bank account. I ask how she reads the bank statements. For each payment, she gets a receipt, and her children will read the amount for her. Sometimes she checks and looks at all the receipts and calculates in her head.

Reflecting on my observations, I realize that market vendors frequently buy by weight and sell by number. This might be the case because people buy small quantities of vegetables, which are not easily weighed in units of 100 g or so. Bigger scale trade uses international measurement systems, e.g. some goods like fish and rice are mostly sold using scales.

Mariama is an expert at mental calculation. She seems to know a lot of calculations by heart, e.g. multiples of 5, which is 25 CFA in the context of money. I have noticed that many food items cost 25 CFA. Strategies I observed include regrouping of concrete objects, counting, and mental calculation strategies of decomposition and repeated grouping. She has a fairly good knowledge of addition, subtraction and some multiplication, but sometimes used multiple additions rather than multiplication. Many women I know have limited or no mental calculation skills. I even talked with a young vendor who sells fresh fish at the common price, without knowing how to calculate well. Moreover, most women do not know how to read scales and have no notion of Western measurements of weight.

Implications of social practice theory for the development of a numeracy programme

Analysing my observations of traditional numeracy practices from a social practice viewpoint has led me to various suggestions for the development of a numeracy programme for women.

Choice of language

The logical conclusion for the choice of language in the class-room is the language used in everyday life. It is people's first language in which they can express themselves best, and in which all the numeracy practices I observed happened. Meaney, Fairhill & Trinick emphasize the fact that "cultural practices including ethnomathematical ones cannot be separated from the language in which they were developed", since the language used impacts how students perceive the practices (2008, pp. 62-63).

The Gusilay number system responds to the needs of society and has been developed and adapted to new demands. The challenges posed by the length of higher number words, the lack of vocabulary for new concepts and written calculations with numbers in the context of money will need to be addressed. Traditional concepts should be used where possible when developing new vocabulary, e.g. the expression ‘gassanar’ could be introduced to denote tens. In order to be immediately relevant, I propose that the programme begins with numbers in the context of buying and selling. Therefore the different value of numbers in the context of money will be discussed in the class, in order to avoid confusion. “25 CFA + 25 CFA = 50 CFA” will be written as “E 5 + E 5 = E 10”. This might need to be tested.

The language issue could lead to a discussion of values, goals and conflicts, since the younger women and children in Thionck-Essyl learn mathematics in school in French. Often local languages are viewed as inferior, and it might surprise some people to realise that they can say everything they need and want to express in their language.

Relationships and power relations

The issue of relationships needs to be addressed at various levels. A class constituted of women belonging to the same age group or association has the advantage of group dynamics, relationships and rules within the group matching traditional standards and being already established. The teacher should be a Gusilay woman, since women will feel less threatened and more inclined to trust another woman than a man. The choice and training of teachers should happen bearing in mind Street’s observation, made in the context of literacy: “The way in which teachers or facilitators and their students interact is already a social practice that affects the nature of the literacy being learned and the ideas about literacy held by the participants, especially the new learners and their position in relations of power” (Street, 2003, p. 77). The group could be viewed as an already established “community of practice”, in the sense of being involved in “a more encompassing process of being active participants in the *practices* of social communities and constructing *identities* in relation to these communities” (Wenger, 1999, p. 4, emphasis in the original). Class activities will include discussions, role play, dancing and singing.

Another issue that needs to be addressed is the questions of who establishes the curriculum, who is responsible for developing and running the programme, and in which ways do teachers and learners participate in decision making, the governance of the class, etc.

Power relations are also influenced by the fact that attending a numeracy class empowers women by increasing their understanding of basic mathematical concepts and their ability to mathematize and by giving them skills and confidence to better face numeracy related challenges. As Mellin-Olsen put it, mathematics “is also a structure of thinking–tools appropriate for understanding, building or changing a society.” (1987, p. 17).

A strong foundation of traditional knowledge

The envisaged numeracy programme will aim at building on participants’ “funds of knowledge” (Moll, Neff & Gonzalez, 1992) rather than focussing on their deficits (Baker, 2009). Traditional numeracy practices have great value and will serve as a strong basis for an adult numeracy programme. Building on and giving value to these practices makes learners aware that they already know and use a lot of numeracy skills, strengthens their roots and self-esteem and increases their motivation for learning more. For example, discussing the numeracy skills used when cooking a meal will help women realise how much they know already. Making existing mental calculation strategies explicit and available to all learners will enable them to use a very practical skill that fits well into the

context of a largely oral society. Other funds of knowledge in the larger sense include ways of categorising, traditional wisdom expressed in proverbs, games and riddles, and traditional ways of measuring time and capacity with their inherent values.

Baker encourages going “beyond a limited focus on number and also include concepts from shape, space, data, patterns, ways of thinking etc.” (2009, p. 14). The Reflect method, with its focus on development of maps, matrixes, calendars and diagrams that “represent local reality, systematise the existing knowledge of participants and promote the detailed analysis of local issues” (Archer and Cottingham, 1996, p. 5) represents a helpful approach.

Teaching numeracy as practices

Fourthly, the aim is to teach numeracy as practices rather than skill (Baker, 2009), which in turn encourages a teaching style of facilitating (Tett, Hamilton & Hillier, 2006). Baker (2009) suggests seeking to work from everyday practices towards formal numeracy practices and to be explicit when switching between the two. Gebre et al. (2009) emphasizes the importance of making numeracy taught and practiced in the classroom similar to real life in order to facilitate transfer.

Ideally an income generating project accompanies the numeracy teaching and learning, so that the women can practice their newly acquired knowledge and skills immediately. For example, the group could meet in their communal garden and learn how to weigh by weighing their harvested vegetables or calculate their profit when selling them. They could count and calculate in the context of selling their produce to their clients. The introduction of new forms of numeracy could include the teaching of written numeracy, introduced with challenges like writing income-expenditure lists, opening a bank account and learning how to read the bank statements, reading children’s health booklets or the instructions for taking medicine.

“Discover, Discuss and Develop”

Finally, teaching and learning will be relevant to learners’ daily experiences, with discussion and reflection as important components of classroom practice. The approach “Discover, Discuss and Develop” (Gebre et al., 2009) could be used with the group. The teacher and learners, in this context all from the same ethnic group, identify together what people know about numeracy practices in the community, and the group then discusses the issues raised. The third step is to build on to the first two steps, for example by introducing new forms of numeracy according to what is relevant to the learners.

A discussion on differences in values and ways of classification of Gusilay and Western culture could be introduced with the question whether known strategies need to be replaced by new ones. I doubt that the strategy of estimation in cooking or in field work needs to be replaced by more precise measurements. In contrast, more precision is needed when weighing ingredients for making soap or taking medicine at specific times. The technique of estimation, traditionally not used in the context of numbers, could be discussed and maybe applied to the context of money in situations where exactness is not required, for example in estimating roughly whether the change received is correct.

Problems encountered in learners’ daily lives will form the basis of learning in the class room, with teachers using a problem-solving approach (Fordham, Holland & Millican, 1995). The use of different strategies to get to a solution is encouraged, discussed and taught explicitly (Ginsburg & Gal, 2000), since in everyday practices a variety of strategies and approaches are used also. Discussions with the

whole group should foster the ability to analyse and reason rather than imitate and learn by heart. Investigation and cooperation will be encouraged by working on problems in pairs or small groups.

The class could organise a small project like buying, roasting and selling peanuts and plan, discuss the processes, results and challenges encountered as part of the learning experience. A presentation of the history of mathematics could serve to show learners that mathematics is by no means an import from the West, but has some of its roots in Africa.

Conclusion

My research on some numeracy practices of the Gusilay shows the existence of a variety of traditional practices, techniques, values and concepts. An analysis of my observations from a social practice theory viewpoint has led me to suggest five basic considerations for the development of a numeracy programme for women:

The first language of the participants, used in everyday numeracy practices, will be the language of instruction. Attention needs to be given to the issue of relationships, including power issues, on various levels including that of programme designers, teachers, classroom practice and the resulting changes of power relations as an outcome of the learning experience. The numeracy programme will attribute value to and build onto traditional knowledge. Discussing and making knowledge and techniques available to all learners will form the basis of the programme, at the same time increasing learners' self-esteem and motivation by affirming their roots and identity. Numeracy will be taught as practices, with the teacher seeking to work from everyday practices towards formal numeracy practices. Finally, learning is facilitated through discovery, discussion and reflection. The goal of the numeracy programme is to see women grow in dignity and self-confidence, prospering by actively increasing their knowledge, using literacy, numeracy and language to meet their felt needs and to develop in areas that are important to them.

References

- Archer, D. & Cottingham, S. (1996). *The Reflect Mother Manual: A new approach to literacy*. London: ActionAid.
- Ascher, M. (1991). *Ethnomathematics: A multicultural view of mathematical ideas*. New York: Chapman & Hall.
- Baker, D. (2009). *Using sand to count their number: developing teachers' cultural and social sensitivities*. Retrieved from <http://www.waalc.org.au/09conf/docs/>.
- Baker, D., Street, B. & Tomlin, A. (2008). *Navigating numeracies: Home/school numeracy practices*. Dordrecht: Springer.
- Barton, D. & Hamilton, M. (1998). *Local literacies: Reading and writing in one community*. London: Routledge.
- Bhola, H.S. (1994). *A source book for literacy work: Perspectives from the grassroots*. London/Paris: Jessica Kingsley Publishers/UNESCO Publishing.
- Carraher, T.N., Carraher, D.W. & Schliemann, A.D. (1985). Mathematics in the streets and in schools. *British Journal of Developmental Psychology*, 3, 21-29.
- Dalbéra, C. (1990). *Arithmetic in daily life and literacy*. Paris: UNESCO International Bureau of Education.
- D'Ambrosio, U. 2001. *Ethnomathematics: Link between traditions and modernity*. Rotterdam: Sense Publishers.
- Evans, J., Wedege, T. & Yasukawa, K. (2013). Critical perspectives on adults mathematics education. In M.A. Clements, A. Bishop, C. Keitel, J. Kilpatrick, F. Leung (Eds.) *Third International Handbook of Mathematics Education* (pp. 203-242). Dordrecht: Springer.
- Fordham, P., Holland, D. & Millican, J. (1995). *Adult literacy: A handbook for development workers*. Oxford: Oxfam.
- Gebre, A.H., Rogers, A., Street, B. & Openjuru G. (2009). *Everyday literacies in Africa: Ethnographic studies of literacy and numeracy practices in Ethiopia*. Kampala: Fountain Publishers.
- Gee, J. (1990). *Social linguistics and literacies: Ideology in discourses*. Hampshire: Falmer.

- Ginsburg, L. & Gal, I. (2000). Instructional strategies for adult numeracy education. In I. Gal (Ed.), *Adult numeracy development: Theory, research, practice* (pp. 89-114). Cresskill, NJ: Hampton Press.
- Heath, S. B. (1983). *Ways with words: Language, life, and work in communities and classrooms*. Cambridge: Cambridge University Press.
- Kané, A. E. (1987). *Les systèmes de numération parlée des groupes ouest-atlantique et mandé : Contribution à la recherche sur les fondements et l'histoire de la pensée logique et mathématique en Afrique de l'Ouest*. Ph.D. dissertation. University of Lille III.
- Knowles, M., Holton III, E. & Swanson, R. (1998). *The adult learner*. Amsterdam: Elsevier Butterworth Heinemann.
- Lave, J. (1988). *Cognition in practice: Mind, mathematics, and culture in everyday life*. Cambridge: Cambridge University Press.
- Lave, J. & Wenger, E. (1991). *Situated learning: Legitimate peripheral participation*. Cambridge: University of Cambridge Press.
- Maddox, B. (2001). Literacy and the Market: The economic uses of literacy among the peasantry in North-West Bangladesh. In B. Street (Ed.) *Literacy and development: Ethnographic perspectives* (pp. 137-152). London: Routledge.
- Meaney, T., Fairhill, U. & Trinick, T. (2008). The role of language in ethnomathematics. *Journal of Mathematics and Culture*, 3(1), 52-65.
- Mellin-Olsen, S. (1987). *The politics of mathematics education*. Dordrecht: Reidel.
- Moll, L.A., Neff, D. & Gonzalez, N. (1992). Funds of knowledge for teaching: using a qualitative approach to connect homes and classrooms. *Theory into practice*, XXXI(2), 131-141.
- Nabi, R., Rogers, A. & Street, B. (2009). *Hidden literacies: Ethnographic studies of literacy and numeracy practices*. Bury St. Edmunds: Uppingham Press.
- Papen, U. (2005). *Adult literacy as social practice: More than skills*. London: Routledge.
- Saxe, G. (1991). *Culture and cognitive development: Studies in mathematical understanding*. Hillsdale NJ: Lawrence Erlbaum Associates.
- Street, B. (1984). *Literacy in theory and practice*. Cambridge: Cambridge University Press.
- Street, B. (2003). What's "new" in new literacy studies? Critical approaches to literacy in theory and practice. *Current Issues in Comparative Education*, 5(2), 77-91.
- Street, B., Baker, D. & Tomlin, A. (2008). *Navigating numeracies: Home/school numeracy practices*. Dordrecht: Springer.
- Tett, L., Hamilton, M. & Hillier, Y. (2006). *Adult literacy, numeracy and language*. Berkshire: Open University Press.
- UNESCO. (2012). *Adult and youth literacy, 1990-2015: Analysis of data for 41 selected countries*. Montreal: UNESCO Institute for Statistics. Retrieved from <http://www.uis.unesco.org/Education/Documents/UIS-literacy-statistics-1990-2015-en.pdf>.
- Wenger, E. (1999). *Communities of practice: Learning, meaning and identity*. Cambridge: Cambridge University Press.
- Yashina, E. (2011). *Les numéraux en langue gusilay*. (unpublished document).
- Zaslavsky, C. (1999). *Africa counts: Number and pattern in African cultures* (3rd ed). Chicago: Lawrence Hill Books.